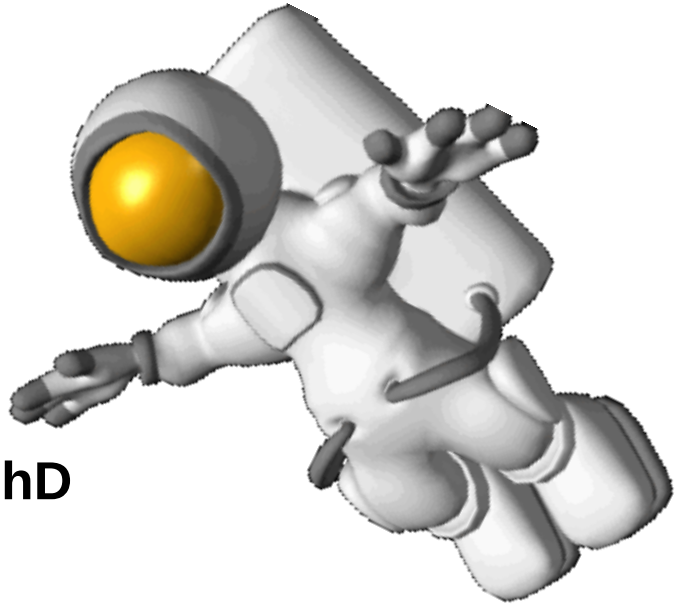
# Information Technology Infrastructure Committee (ITIC) Report to the NAC

## Aug 5, 2010



**Charles Holmes, PhD**

**Vice-Chair ITIC**

# OUTLINE

- Committee Members
- ITIC work plan
- Tele-Meeting – 7/27/2010
- Cyber security
- NASA's virtual institutes
- NASA's mission operations infrastructure
- Subcommittee Activities
- Future meetings (ITIC & ASCS)
- NASA IT Summit
- Questions/Comments

# Committee Members

- **Membership**
  - Ret. General Albert (Al) Edmonds (Chair), President - Edmonds Enterprise Services, Inc.
  - Mr. Alan Paller, Research Director - SANS Institute
  - Dr. Robert Grossman, Professor – University of Illinois
  - Dr. David Waltz, Director, CCLS – Columbia University
  - Dr. Larry Smarr, Director – California Institute for Telecommunications and Information Technology
  - Dr. Charles Holmes (Vice-Chair), Retired – NASA
  - Ms. Debra Chrapaty, Senior VP – CISCO
  - Dr. Alexander Szalay, Professor – Johns Hopkins University
  - Dr. Alexander H. Levis, Professor - George Mason University

    Chair of the **AVIONICS, SOFTWARE AND CYBERSECURITY SUBCOMMITTEE**

  - Ms. Tereda J. Frazier (Exec Sec), Special Assist. to CIO, NASA

# ITIC Work Plan

- Examine the ongoing and planned efforts for the IT Infrastructure and mission areas.
- Develop recommendations for an investment strategy for updating the infrastructure while greening it and at the same time reduce lifecycle costs.
- Investigate the state of NASA's high performance networks, high performance computing systems, and data intensive computing systems.
- Investigate the state of NASA's software and infrastructure support for collaborative teams.
- Examine NASA's data and communications environment for its aerospace operations and point out areas in need of attention.
- Examine the role of the OCIO, its strategic plans and projected resources, and IT governance across NASA.

# Agenda for the July 27th Teleconference

- **Tele-Meeting format**
- **Progress reports on fact finding for tasks in the ITIC Work Plan**
  - Cyber Security Operations
  - Collaboration capabilities – NASA Virtual Institutes
  - Mission Operations Networks
- **Avionics, Software, and Cybersecurity Subcommittee (ASCS) Status Briefing**
- **Plans and future meetings**

# Possible Finding
# [reported by ITIC at NAC meeting 4/29/10]

- **More than $12 million is being spent on out-of-date security compliance reports and can be shifted into continuous monitoring and improvement.**

- **Update since 4/29:**
  - At our first committee meeting at NASA headquarters, it was briefed that millions of dollars were spent filling out IT security compliance forms for different governmental activities.
  - Our committee challenged the NASA staff to try to find a way to reduce the amount of paper work and using those dollars to improve the security of NASA's IT infrastructure.
  - The CIO and Chief Information Security Officer (CISO) took the challenge and brought forth something NASA has already started - real time monitoring of several NASA network activities and proposed to curtail the compliance reporting.
  - When NASA publicized this, OMB and congressional staffers commended them.
  - The Security Operations Center (SOC) at Ames has now taken on more importance to the overall NASA cyber security objectivities.
  - This episode has resulted in the CISO being recruited and hired away by the VA but
  - Our entire committee will be meeting at Ames the end of September to get smart on the SOC and receive information on other NASA collaboration ideas.

- **The ITIC will follow up on this story and report to the NAC at its next meeting.**

# Cyber Security

- **The ITIC chair, the subcommittee chair, and subcommittee executive secretary visited Lockheed Martin's center of excellence where the host demonstrated new ideas and techniques in cyber security. Lockheed is working on these initiatives with people at JPL.**

- **At GSFC, ITIC chair, the subcommittee chairman and executive secretary met with mission managers, NASA CIO and GSFC CIO. They received some classified presentations that furthered our understanding on how cyber security is planned and integrated into NASA programs and missions.**

# NASA Virtual Institutes and Center for Collaboration Sciences and Applications

## NASA Ames Hosts Two NASA Virtual Institutes

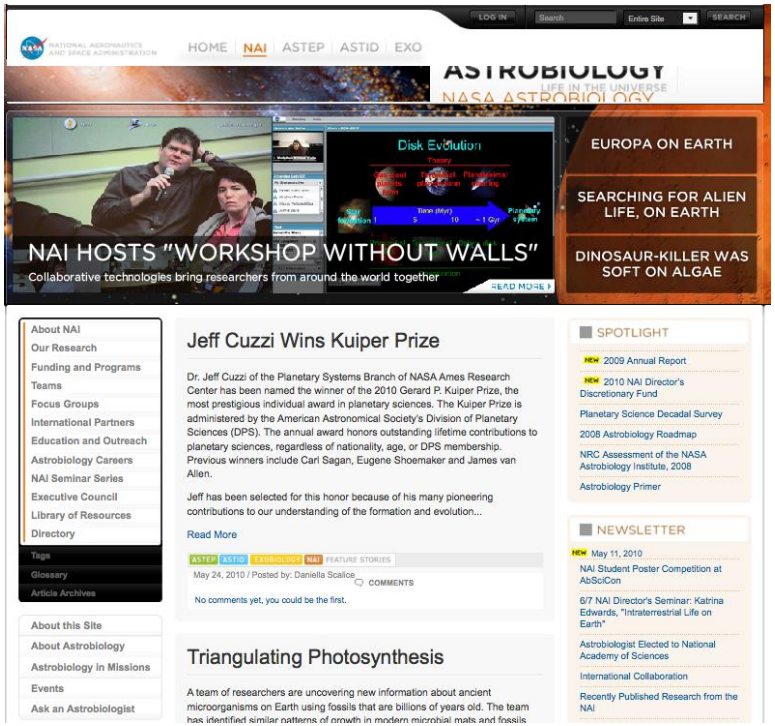
- NASA Astrobiology Institute (NAI)
- NASA Lunar Science Institute (LSI)

**Compiled from NAI/NSLI and CCSA presentations**

**Source: Estelle Dodson, Michael Sims @ NASA Ames**

# NAI Website

- Used to coordinate and support workshops and seminars
- Hosts the Annual Report
- Member Directory
- Announce research and funding opportunities
- Careers Page
- Events
- Research highlights
- Seminars and archives
- Focus group page
- Functionality and user interface a priority
- Feeds into Twitter with over one million followers!

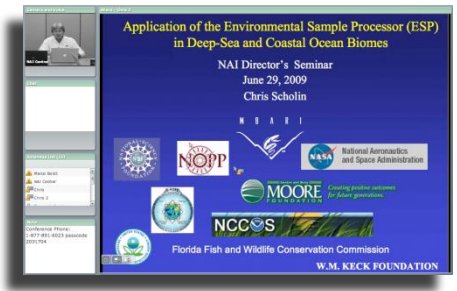




Webby Honoree in 2009

# Video Conferencing: Now

- **Self managed by users**
- **Core Technologies**
  - Polycom HD videoconferencing endpoints
  - Codian 30 port HD Multipoint Controller Unit (MCU)
  - Adobe Connect (AC)
- **Users can participate in meetings using an array of devices**
  - HD room-based Videoconferencing + AC
  - Desktop videoconferencing +AC
  - Smart phone + AC
  - Adobe Connect only using streaming audio/VoIP
  - Mobile Device with flash browser or App (iPhone)
- **Trained users can resolve technical problems**
- **Archive available for viewing immediately afterwards via the web**

**Old school:**

- Complicated
- Third party required
- No customization


**New and Improved:**

- One click
- End user enabled
- Customizable and responsive

# High Definition Video Connected OptIPortals: Virtual Working Spaces for Data Intensive Research


NAI and NLSI are partnering with leaders in science data visualization to make state of the art tools available to researchers.

Source: Falko Kuester, Kai Doerr Calit2; Michael Sims, NASA

# NAI Workshop Without Walls

March 11-12, 2010

## The Organic Continuum from the Interstellar Medium to the Early Solar System


180 registrants from 21 US states and 16 other countries

# Overview of NAI Workshop without Walls

- **Science Organizers:**
  - George Cody, Carnegie Institution of Washington
  - Doug Whittet, Rensselaer Polytechnic Institute
- **33 science talks with 1/3 time for discussion**
- **8 videoconferencing sites connected using the NAI videoconferencing bridge**
- **Adobe Connect used for slide and audio sharing to individuals around the US and world**
- **180 registrants from 21 US states and 16 other countries**
- **Planning time**
  - Jan 27: Call for abstracts to all current and former NAI members
  - Feb 20: abstracts due
  - March 2: program posted/ broad announcement to newsletter mailing list
  - March 11-12: Workshop


# Center for Collaboration Sciences and Applications (CCSA)

**NASA Ames, Carnegie Mellon Silicon Valley and Lockheed Martin have formed an exciting new virtual center to explore the science and the applications of collaboration.**

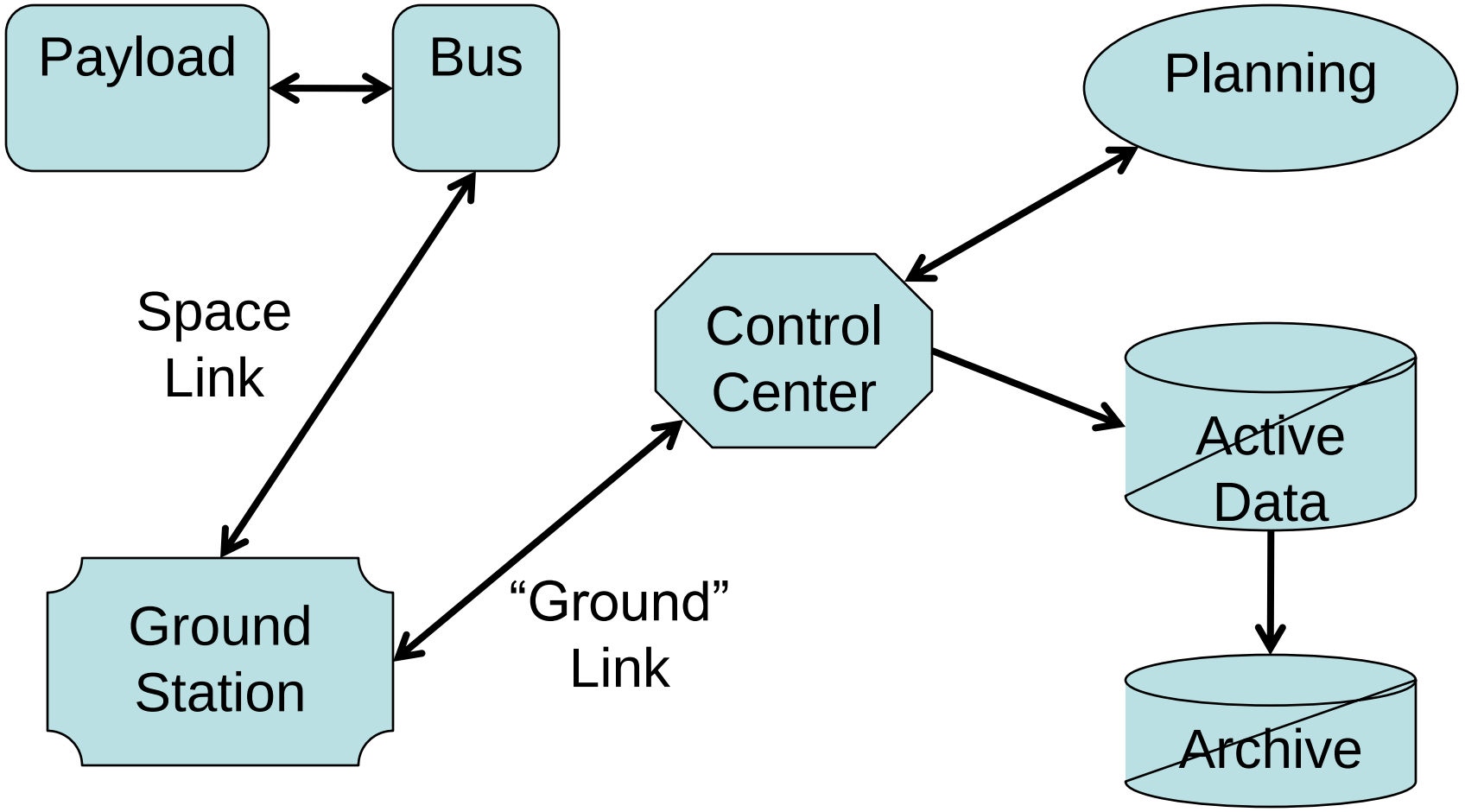
**CCSA's mission statement is:**

- To be a center of excellence in pioneering collaboration as a scientific investigation integrating multiple disciplines
- To provide state of the art expertise and recommendations for projects, missions and teams doing collaborative work
- To create, evaluate and implement collaborative systems, social protocols and procedures
- To provide open environments for the investigation and application of collaborative technologies

# Notes on ITIC Work Plan Talk 5

- **Examine NASA's data and communications environment for its aerospace operations and point out areas in need of attention.**

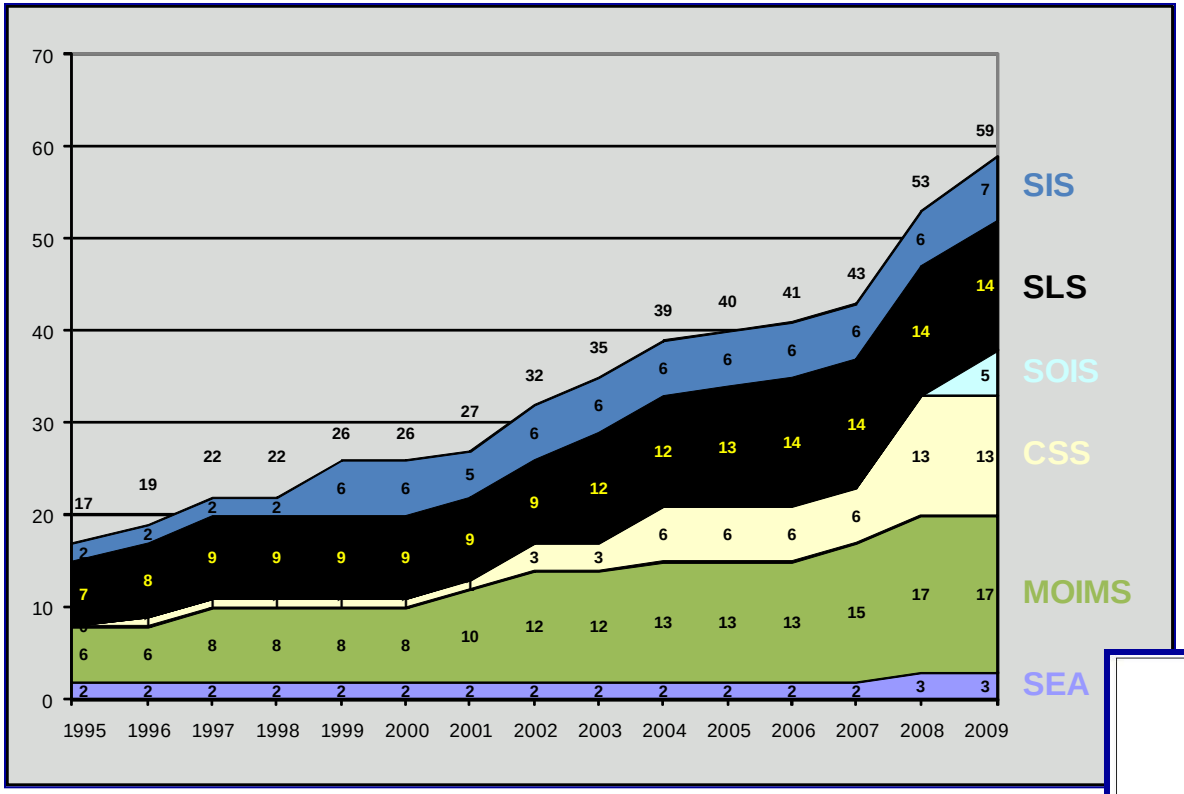
# Generalized Mission Communications Topology



# Network Glue: Interface Standards

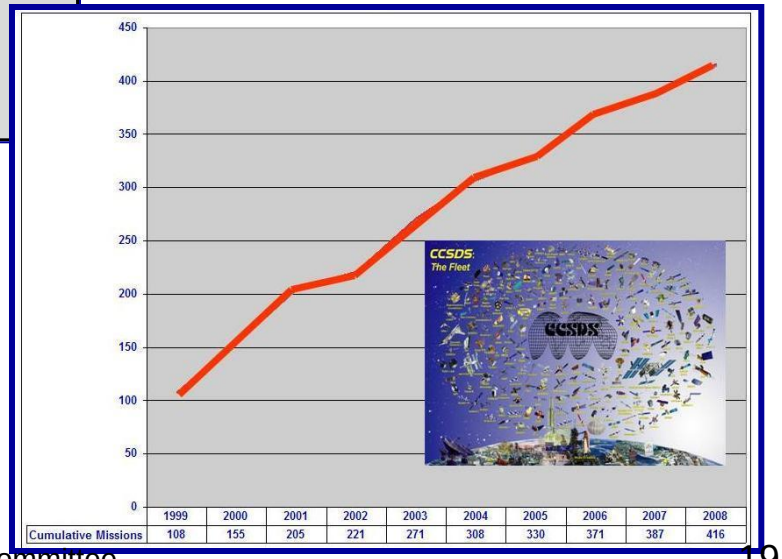
- **CCSDS**
  - Introduced in early 1990s; now a permanent secretariat
  - Packetized data structures
  - Standardized comms software in
    - Instruments <-> Spacecraft <-> MOC
- **Space Link Extension (SLE)**
  - Introduced in ~2000
  - XML-based communications standards between ground stations and MOCs
  - Overlays CCSDS packets over IP packets plus more
- **GMSEC**
  - Introduced ~2006
  - XML-based communications standard within the processes of a MOC

# CCSDS Overview

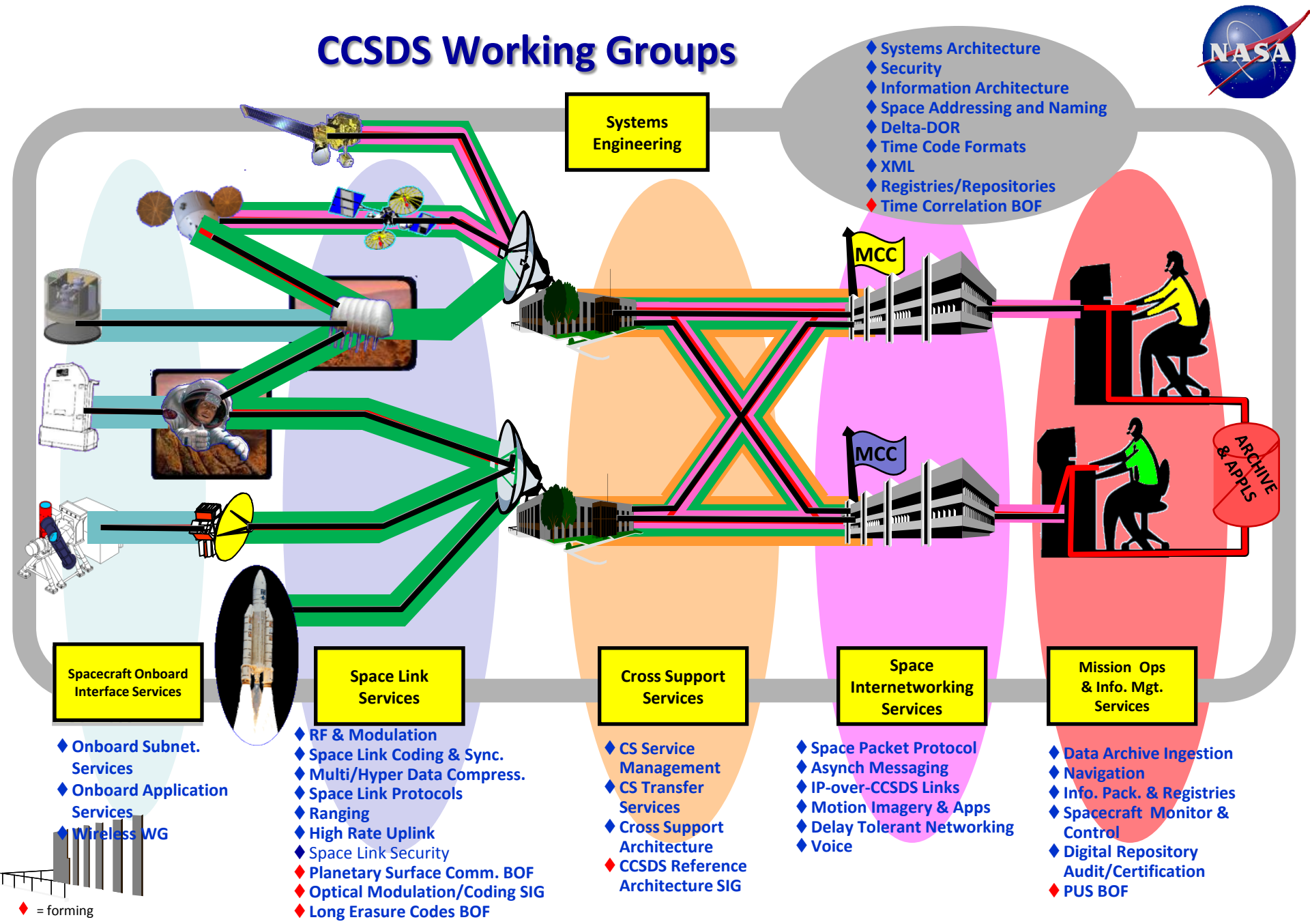



**59+ Standards and Practices**

**430+ missions**

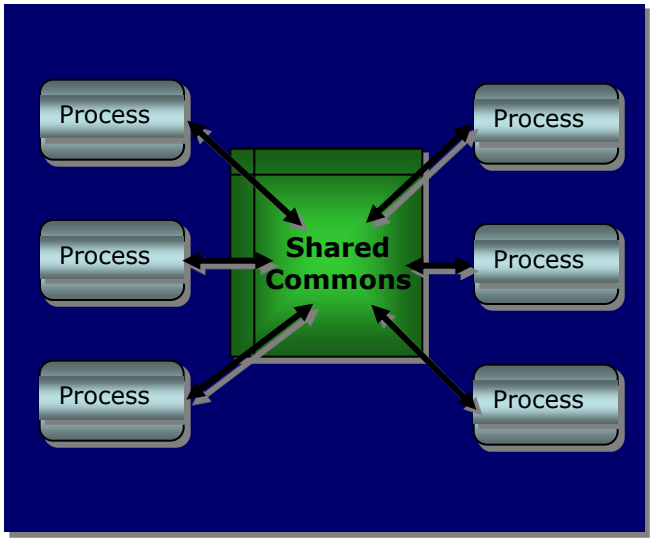


# CCSDS Working Groups

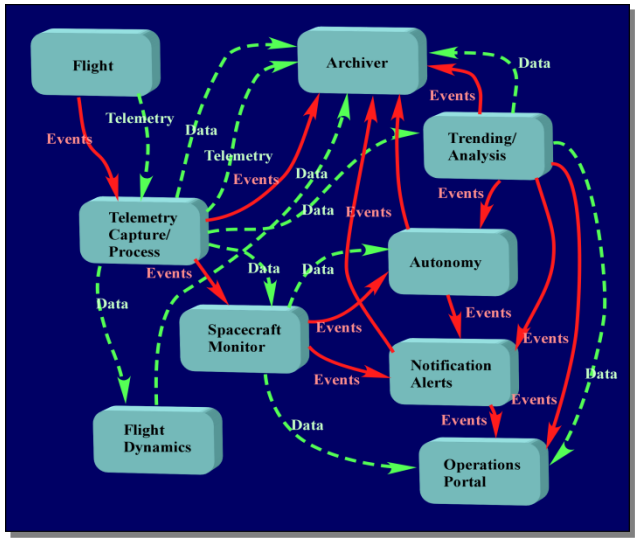


# History of Software System Architectures

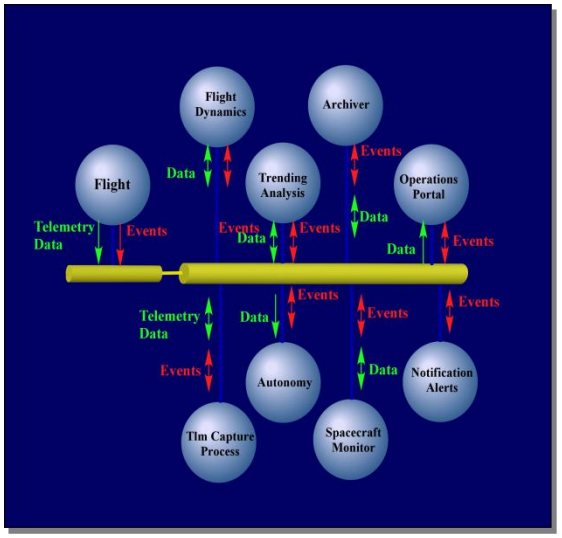
Shared Commons
(1970's -1980's)




Traditional Design
Socket Connections

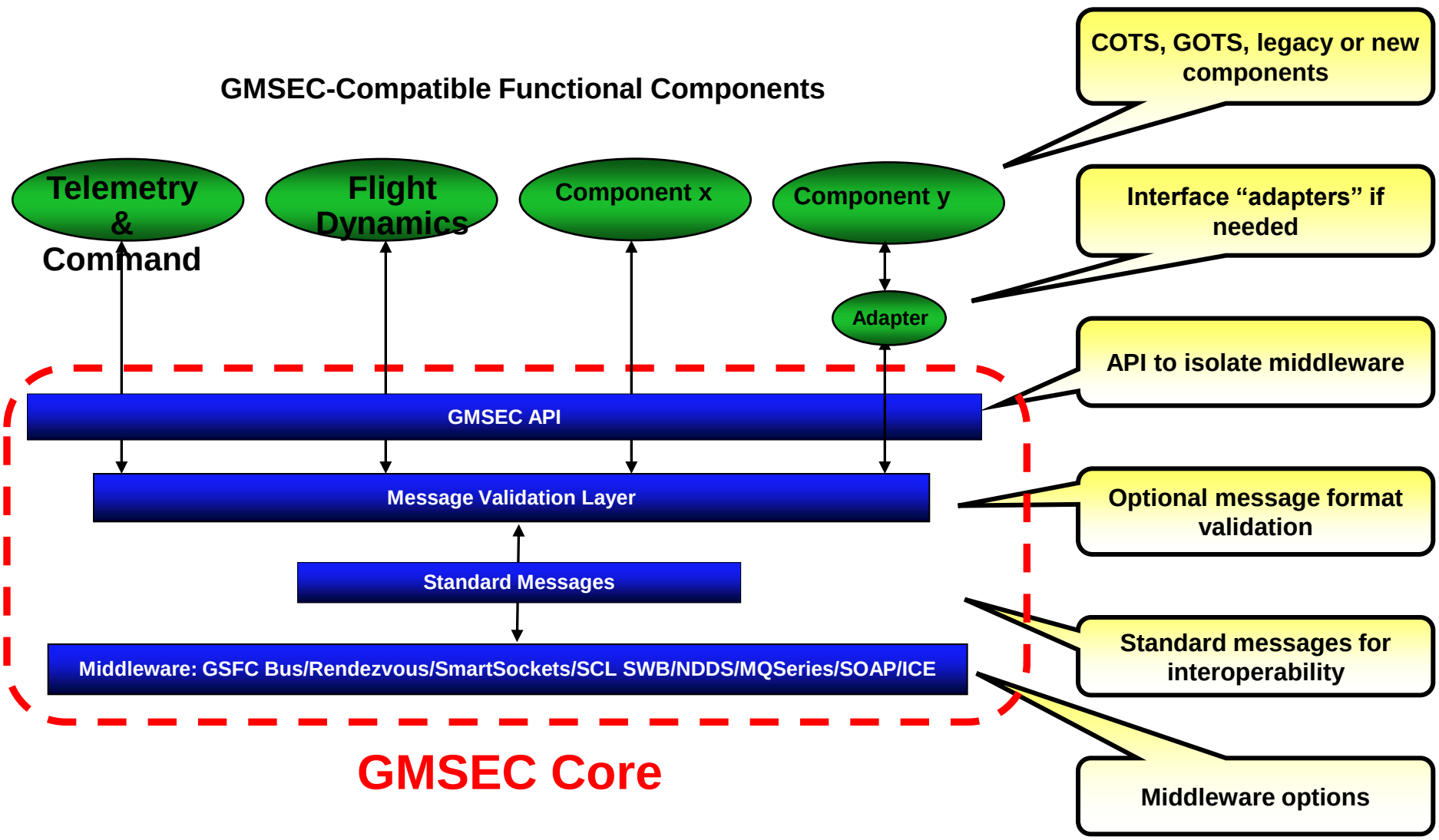



Current Advanced Designs
Middleware Connections




***GMSEC software applies modern development approaches to ground system applications.***

# GMSEC Message Bus Architecture



# Avionics, Software, and Cybersecurity Subcommittee (ASCS)

## Report to NAC IT Infrastructure Committee

**23 July 2010**

# ASCS MEETING - May 13-14 – NASA HQ

- **ACS Subcommittee received instruction on ethics and FACA rules**
- **ASCS received briefings on:**
  - Perspectives on Cyber Security by the Chief Engineer, M. Ryschkewitch, by Phil Bounds, and by Jerry Davis
  - Science Mission perspectives by J. Bredekamp
  - Cloud Computing
  - NASA Integrated Services Network (NISN) by Betsy Edwards
- **Al Edmonds, Bob Grossman, Chuck Holmes, and Alan Paller attended parts of the meeting**

# ASCS: PURPOSE AND PLANS

- **The subcommittee resolved to explore the mission areas**
  - Understand their common characteristics
  - Identify individual needs
  - Explore security and software issues within and across mission areas

- **Visit to Ames Research Center (tbd)**
  - NASA IT Security Operations Center
  - Project Nebula – Cloud Computing
  - Software and complex electronics

- **Visit to Goddard Space Center (part of Nov 1 week)**

# ASCS Areas of Consideration

- **Cyber:**
  - How to best mature and expand the Security Operations Center
  - How to better implement a holistic approach to security around space assets, in particular cyber at ground stations

- **Software:**
  - How to manage/develop complex electronics
  - Better or more efficient ways to manage complex/critical software development
  - How to capture the architecture and share data among developers?
  - How to capture requirements and refine them as development progresses?
  - How to best do V&V to ensure design meets requirements?
  - What level of independent backup control systems are needed to avoid common cause failures taking down whole control system?

# Future Meetings of the ITIC

- **Ad-hoc groups visiting HQ and the field centers to meet with NASA personnel for fact finding.**
  - Discussion with JPL multimission operations engineering on Aug 6.
  - Discussion with OCIO officers scheduled for Sept 15 & 16.
- **Next planned ITIC FACA meeting is at AMES Research Center on September 28 - 29.**
- **Future meetings under consideration for 2011: January 26 & 27, etc.**

# NASA IT Summit – August 16-18
# National Harbor Convention Center
# (http://www.nasa.gov/offices/ocio/itsummit)

- **The Summit's theme is "Make IT Stellar at NASA,"**
  - the audience includes NASA IT employees, the federal CIO community, academia, industry, and professional IT associations.
- **The objectives are:**
  - to provide avenues for continuous learning with perspectives on the internal and external IT landscape;
  - to provide a larger forum for networking among peers, enabling a greater sense of the NASA IT community;
  - to highlight and share best practices;
  - to focus on IT mission-enabling capabilities;
  - to invite well-known keynote speakers to address global subject areas of innovation and the future of IT.

- **Full agenda has been organized; over 900 registrants; outstanding roster of invited speakers**

# Questions or Comments